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## Automatic Sex-Liking and Sex-Failure Associations in Men With Sexual Dysfunction

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Current models of sexual functioning imply an important role for both automatic and controlled appraisals. Accordingly, it can be hypothesized that erectile dysfunction may be due to the automatic activation of negative appraisals at the prospect of sexual intercourse. However, previous research showed that men with sexual dysfunction exhibited relatively strong automatic sex-positive instead of sex-negative associations. This study tested the robustness of this unexpected finding and, additionally, examined the hypothesis that perhaps more specific sex-failure versus sex-success associations are relevant in explaining sexual dysfunction and distress. Male urological patients ( $N = 70$ ), varying in level of sexual functioning and distress, performed two Single-Target Implicit Association Tests (ST-IATs) to assess automatic associations of visual erotic stimuli with attributes representing affective valence (“liking”; positive versus negative) and sexual success versus sexual failure. Consistent with the earlier findings, the lower the scores on sexual functioning, the stronger the automatic sex-positive associations. This association was independent of explicit associations and most prominent in the younger age group. Automatic sex-positive and sex-failure associations showed independent relationships with sexual distress. The relationship between sexual distress and sex-failure associations is consistent with the view that automatic associations with failure may contribute to sexual distress.

Research into cognitive determinants of sexual functioning and sexual dysfunction has thus far mainly focused on the

role of cognitions of which individuals can be aware. Barlow (1986) forwarded a model of sexual functioning in which the role of cognitive interference was specified in different feedback loops for men with and without sexual dysfunction to explain their differences in sexual functioning. The model was based on a series of experimental studies comparing men with and without sexual dysfunction. Men without sexual dysfunction are theorized to expect adequate sexual performance in this situation and to be able to focus their attention on present sexual stimuli and sexually stimulating thought content, whereas men suffering from sexual dysfunction would be distracted from processing erotic stimuli and would expect sexual failure. In a more recent series of observational studies, using self-report questionnaires, Nobre and

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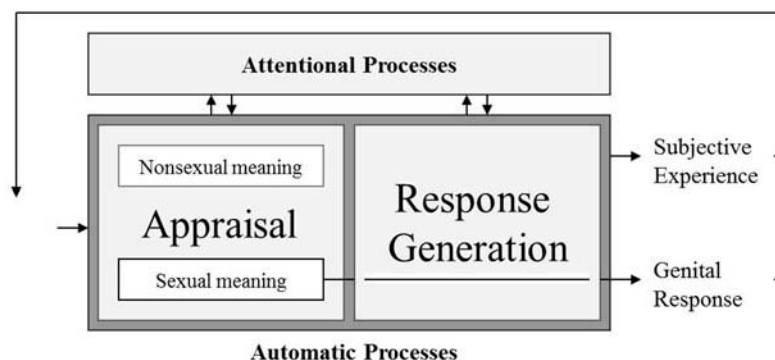
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colleagues found support for different patterns of conscious thoughts, attitudes, and sexual self-schemata in men and women with and without sexual dysfunction (Nobre, 2010; Nobre & Pinto-Gouveia, 2006). However, cognitive processing occurs at different levels of awareness and regulatory control, and suggestions have also been put forward that a relevant part of the variability in sexual behavior and sexual feelings might be explained by automatic attitudes that are not accessible for self-reflection and that may occur outside of awareness (e.g., Geer & Robertson, 2005; Janssen, Everaerd, Spiering, & Janssen, 2000). Attitudes are defined here as cognitive associations of stimuli with evaluative adjectives. They are reflections of one's likes, dislikes, preferences, and evaluations, and they inform and shape one's behavior (see Cooper, Blackman, & Keller, 2016). The information-processing theory of sexual responding (Janssen et al., 2000) postulates a role for both controlled and automatic cognitive processes in the causation of genital responses and subjective experiences of sexual arousal. The theory proposes that the appraisal of stimuli as sexual or nonsexual occurs both at reflective and automatic levels of processing (see Figure 1). The appraisal process involves the analysis of the affective valence of the stimulus and its personal relevance for one's interests (Frijda, 1993), including the implicit associations, beliefs, and attitudes with regard to the stimulus. Thus, erotic stimuli, whether or not they are consciously perceived, may automatically initiate the physiological process that produces the genital response (Spiering & Everaerd, 2007). Men with sexual dysfunction and nonsymptomatic men may thus (also) differ with regard to how they automatically process erotic stimuli. Because automatic attitudes are considered to develop as a result of frequent pairings of stimuli with the same emotional state (Gawronski & Bodenhausen, 2006), and men with sexual dysfunction typically report repeated experiences of negative feelings in sexual situations, it seems reasonable to assume that men with sexual dysfunction would show less positive automatic evaluations of erotic stimuli than nonsymptomatic men.

Several methods are available for assessing automatic cognitions, using reaction times and choice preferences in computer-based tests, including the affective priming paradigm (Fazio, Sanbonmatsu, Powell, & Kardes, 1986), the

Affective Simon Task (De Houwer, Crombez, Baeyens, & Hermans, 2001), the Extrinsic Affective Simon Task (De Houwer, 2003), approach and avoidance tasks (De Houwer et al., 2001), and the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998). The IAT was used in the present study for its relatively high validity and reliability in assessing both individual and group differences in automatic attitudes (De Houwer & De Bruycker, 2007; Nosek, Greenwald, & Banaji, 2005; Roefs et al., 2011). Moreover, it has been found to have differential predictive validity for relatively automatic behaviors (e.g., Rudolph, Schröder-Abé, Riketta, & Schütz, 2010). The IAT is based on the premise that participants respond faster when target–attribute pairs that are closely associated in memory share one response key compared to when nonassociated target–attribute pairs are mapped on the same key. Evidence exists that implicit associations indeed capture such associations between constructs in memory. Previously unknown stimuli were found to be implicitly associated as indexed by an IAT after they became connected in a classical conditioning procedure (Olson & Fazio, 2001) while participants were unaware of the contingent pairing of both stimuli during the procedure. Whereas automaticity of evocation upon the mere perception of the stimulus is a quintessential aspect of the construct of interest (De Houwer, Teige-Mocigemba, Spruyt, & Moors, 2009), IAT performers are not necessarily unaware of the associations that are assessed during IAT performance (McNally, 1995; Monteith, Voils, & Ashburn-Nardo, 2001).

A first study of our group using a Single-Target Implicit Association Test (ST-IAT) to investigate automatic associations with erotic stimuli in men with and without sexual dysfunction (van Lankveld et al., 2015) unexpectedly found that men with sexual dysfunction exhibited stronger instead of weaker positive automatic associations with erotic stimuli than nonsymptomatic men, whereas explicit affective associations did not differ between men with sexual dysfunction and nonsymptomatic men. In addition, the two groups did not differ with regard to their automatic wanting associations with erotic stimuli. Wanting refers in this context to a motivational association with erotic stimuli that can be distinguished from the hedonic value of erotic stimuli



**Figure 1.** An information-processing model of sexual arousal by Janssen et al. (2000). *Journal of Sex Research*. Reprinted with permission.

(Robinson & Berridge, 1993, 2008). In the ST-IATs that were used in this earlier study, the valence/liking construct was represented using the words *positive* (represented by the Dutch words for humor, health, gift, and peace) and *negative* (represented by the Dutch words for hatred, war, disease, and pain) as attribute labels, placed in the upper-left and -right corners of the computer screen. The attribute categories for the wanting ST-IAT were “I want” and “I do not want” (represented by the same word stimuli as in the liking ST-IAT). The “erotic” target in both the liking and the wanting ST-IATs was represented by four pictures of heterosexual interaction from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1999). Although these findings point to the relevance of automatic affective associations with regard to sexual dysfunction, the observed direction of the association was counterintuitive, as men with sexual dysfunction were expected to harbor relatively strong negative automatic evaluations of erotic stimuli. Therefore, the first aim of the current study was to test the robustness of this unexpected co-occurrence of automatic sex-positive associations with lower levels of sexual functioning.

Based on theory and previous empirical research (Bach, Brown, & Barlow, 1999; Scepkowski et al., 2004; Weisberg, Bach, & Barlow, 1995), more specific automatic associations of erotic stimuli with, respectively, sexual success versus sexual failure, can also be considered candidate conceptual categories that could differentiate between men with and without sexual dysfunction. Men who have a history of sexual failure might develop an automatic association of sexual stimuli with personal failure, whereas men without such a history will be more self-confident, have stronger automatic associations of erotic stimuli with success, and expect flawless sexual performance. In his model of sexual dysfunction, Barlow (1986) incorporated research showing that men with sexual dysfunction expect relatively low personal efficacy in becoming sexually aroused. Furthermore, in cross-sectional investigations, men with sexual dysfunction were found to harbor more negative sexual self-schemas (Andersen, Cyranowski, & Espindle, 1999), characterized by internal and stable attributions of failure and personal incompetence (Fichten, Spector, & Libman, 1988; Nobre & Pinto-Gouveia, 2009a, 2009b; Weisberg et al., 1995). When men with sexual dysfunction are repeatedly exposed to situations of sexual failure, such negative expectations can also be expected to lead to a stronger automatic association of erotic stimuli with failure, which may contribute to the persistence of sexual dysfunction.

In the current study we not only examined the relevance of automatic associations within the context of sexual functioning but also with regard to the level of sexual distress. Sexual distress is the experience of negative feelings (e.g., fear/anxiety, melancholia, irritation, anger) associated with one's (problematic) sexual functioning. It can be subdivided into personal distress, partner distress, and relational or interpersonal distress (Hendrickx, Gijs, & Enzlin, 2013; Hendrickx, Gijs, Janssen, & Enzlin, 2016). Problematic sexual functioning and the experience of distress related to one's

sexual problems may have distinct origins and underlying cognitive mechanisms. In addition, sexual distress and sexual satisfaction may not be opposing constructs. Evidence is coming forth that sexual distress, sexual functioning, and sexual satisfaction are relatively independent constructs that merit separate scrutiny (Stephenson & Meston, 2010). For example, although increasing age comes with increasing impairments in male sexual functioning (Wagle, Carrejo, & Tan, 2012), sexual distress does not necessarily increase at the same pace, either in men or in women (Hendrickx, Gijs, & Enzlin, 2016; Stephenson & Meston, 2010, 2012). Automatic associations of erotic stimuli with failure might be more crucially involved in high sexual distress, which has been found to have a stronger link to help-seeking behavior than sexual dysfunction as such (Hendrickx, Gijs, & Enzlin, 2016). Therefore, the second aim of this study was to test whether relatively strong automatic sex-failure associations co-occur with lower levels of sexual functioning and higher levels of sexual distress.

In addition to adequate cognitive processing of sexual stimuli, it should be acknowledged that adequate biological functioning is required for the sexual response system to operate effectively, including hormonal (Bancroft, 2005), vascular (Jackson, 2009), and neurological systems (McKenna, 1999). Impairments of these systems can severely compromise sexual functioning (Everaerd & Laan, 1995). Next to more abrupt impairments due to disease and its pharmacological treatment, the functioning of several of these biological systems has been shown to decrease during the individual's lifetime and is therefore significantly associated with age (Call, Sprecher, & Schwartz, 1995; Janssen, Everaerd, Van Lunsen, & Oerlemans, 1994; Wagle et al., 2012). We therefore explored potential confounding aspects of age. Individuals with a wide variety of types of psychopathology have been found to differ significantly from healthy control individuals regarding their automatic cognitive responses to stimuli related to their respective type of psychopathology (for a comprehensive review, see Roefs et al., 2011). To avoid confounding the present findings, men with major clinical psychopathology, assessed using the Hospital Anxiety and Depression Scale (HADS; Spinhoven et al., 1997; Zigmond & Snaith, 1983), were excluded from participation.

In brief, the current study was designed to test the following hypotheses: (1) automatic sex-liking associations are negatively correlated with level of sexual functioning and sexual distress; and (2) automatic sex-failure associations with erotic stimuli are negatively correlated with level of sexual functioning and positively associated with level of sexual distress.

## Method

### Participants

Eligible participants in the study were adult heterosexual men who visited an outpatient urology clinic for various



urological complaints, either with or without sexual complaints. Investigation of this mixed population was considered advantageous due to the substantial variability with regard to sexual functioning among urological patients (van Lankveld & van Koeveeringe, 2003). Mastery of the Dutch language was deemed necessary to be able to answer all relevant questions in the study and to perform the computer tasks. Higher level of psychopathology (HADS total score > 15) was used as an exclusion criterion.

Using  $d = 0.65$  as a conservative mean effect size estimate of IAT effects (see later for a description of how the IAT index is calculated), based on group comparison studies (Nosek et al., 2005), at least 60 participants were required to obtain 80% statistical power, using  $p < .05$ . In total, 83 men were screened for eligibility in the study. One man was excluded due to not completing the test. In addition, 12 men were excluded due to nonheterosexual orientation ( $N = 2$ ), high level of psychopathology ( $N = 9$ ), or both ( $N = 1$ ). Data of 70 participants ( $M_{\text{age}} = 55.7$  years,  $SD = 14.9$  years; range = 18 to 78 years) were retained for further analysis; of these, 36 men had received a sexual dysfunction diagnosis and 34 had visited the clinic for other urological conditions. Eight participants in the latter group also reported experiencing sexual problems in response to the pertinent items of the questionnaire. Characteristics of participants with and without self-reported sexual problems, including their urological diagnoses, are shown in Table 2. Of 53 men in the sample who were involved in a sexual relationship, 10 men (19%) were not sexually active. Of six men who were involved in a relationship but were not cohabiting, one man was not sexually active. Of 11 participants who were not involved in a sexual relationship, six (55%) were not sexually active. In all, 46% of the participants reporting experiencing sexual problems had sought professional help in the past, 48% were currently receiving professional help, and 26% desired such help but had not yet received help.

## Instruments

**Demographic, medical, and sexual health-related information.** A questionnaire was administered collecting demographics (age, education level, relationship status, and relationship duration), and information on sexual functioning (self-reported sexual health, including presence of sexual problems, sexual problem subtype, help seeking, and reception of professional help for sexual problems in the past, and whether help was presently needed or being received). The urologist recorded medical problem type and whether the participant currently used medication that was known to (potentially) affect sexual functioning either positively (i.e., pro-sexual medication) or negatively (i.e., anti-sexual medication), or other medication assumed not to impact sexual functioning (i.e., neutral medication).

### Sexual functioning.

*International Index of Erectile Functioning (IIEF).*

The IIEF (Rosen et al., 1997) is a self-report questionnaire for assessing male sexual functioning that contains 15 items,

organized into five subscales measuring, respectively, erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall sexual satisfaction. Participants provided answers on five-point and six-point scales, with higher scores indicating better sexual functioning. A sum score provides a global index of sexual functioning (IIEF total score). The internal consistency of the IIEF was found to be excellent in previous research (Cronbach's  $\alpha$  between 0.92 and 0.96), and test-retest reliability was high ( $r = .84$ ; Rosen et al., 1997). In the present study, internal consistency was found to range from satisfactory for the sexual desire and overall sexual satisfaction subscales (Cronbach's  $\alpha = .88$ ) to excellent for the erectile function subscale and the total score ( $\alpha = .97$ ).

*Sexual Distress Scale (SDS).* The SDS uses the 12 items of the Female Sexual Distress Scale (Derogatis, Rosen, Leiblum, Burnett, & Heiman, 2002). All aspects of sexual distress that are addressed in the FSDDS are applicable to both female and male sexual problems, and the wording of the items is gender neutral. The FSDDS has been used in male samples (Jern et al., 2008; Van Lankveld et al., 2015). The version of the FSDDS we used was validated in Dutch female samples (Ter Kuile, Brauer, & Laan, 2006). It contains a single dimension and was found to have good psychometric properties, with Cronbach's  $\alpha = .93$ . In the present male sample, the internal consistency was found to be excellent, with Cronbach's  $\alpha = .96$ .

### Implicit associations with sexual stimuli.

*Single-Target Implicit Association Test.* Two ST-IATs (Karpinski & Steinman, 2006) were employed to measure the strength of the automatic associations of a single target category (erotic stimuli) with, respectively, positive versus negative valence, and success versus failure. The erotic target in each of the ST-IATs was represented using four pictures<sup>1</sup> of heterosexual interaction. Pictures depicted a female and a male actor couple engaging in explicit sexual activity, also showing genital areas. Participants were instructed to assign the words and pictures appearing in the center of a laptop computer screen to one of two categories using the  $z$  and  $m$  keyboard keys. The attribute categories for the liking ST-IAT were *positive* (represented by the Dutch words for humor, health, gift, and peace) and *negative* (represented by the Dutch words for hatred, war, disease, and pain), and were identical to those used in van Lankveld et al. (2015). The labels of the attribute categories were continuously shown in the upper-left and -right corners of the screen. Upon a correct response, the next stimulus was presented. Following an incorrect response, error feedback was given using a red  $X$  that replaced the stimulus and

<sup>1</sup> Erotic pictures for the liking ST-IAT were selected from the IAPS (Lang et al., 1999), specifically IAPS numbers 4658, 4659, 4664, and 4680. These pictures were previously used in the study by van Lankveld et al. (2015). The erotic pictures for the success-failure ST-IAT were used in the previous IAT research of Borg, De Jong, and Weijmar Schultz (2010).

**Table 1.** *Sequence of Trial Blocks in the Liking and Success-Failure ST-IAT*

Block	No. of Trials	Function	Items Assigned to Left-Key Response	Items Assigned to Right-Key Response
Sequence of trial blocks in the liking ST-IAT				
1	16	Attribute practice	Positive (8)	Negative (8)
2	16	Practice	Positive (4) + Erotic (4)	Negative (8)
3	48	Test	Positive (12) + Erotic (12)	Negative (24)
4	16	Practice	Positive (8)	Negative (4) + Erotic (4)
5	48	Test	Positive (24)	Negative (12) + Erotic (12)
Sequence of trial blocks in the success-failure ST-IAT				
1	16	Attribute practice	Sexual Success (8)	Sexual Failure (8)
2	16	Practice	Sexual Success (4) + Erotic (4)	Sexual Failure (8)
3	48	Test	Sexual Success (12) + Erotic (12)	Sexual Failure (24)
4	16	Practice	Sexual Success (8)	Sexual Failure (4) + Erotic (4)
5	48	Test	Sexual Success (24)	Sexual Failure (12) + Erotic (12)

*Note.* For half of the subjects, the positions of blocks 2 and 3 were switched with those of blocks 4 and 5, respectively. ST-IAT = Single-Target Implicit Association Test.

remained on the screen until another key was pressed. Table 1 displays the setup of the procedure that was identical in both ST-IAT versions. To familiarize participants with the procedure, they started with a practice block using only attribute stimuli. Next, there were two blocks of 64 trials, each starting with a practice phase of 16 trials in which both erotic pictures and positive and negative attribute words were randomly presented, followed by a test phase of 48 trials. Within the practice and test phases, the numbers of key presses on both response keys were kept equal to prevent the development of a response bias (see Table 1). The target and attribute stimuli were presented in quasi-random order, making sure that each target stimulus was both preceded and followed by an attribute stimulus. No more than two attribute stimuli were presented in a row between two target stimuli. In the first block, erotic pictures and positive words were mapped on the same response key (*sex-positive* combination), whereas in the other block erotic pictures and negative words shared the same response key (*sex-negative* combination). One of the two combinations (*sex-positive* or *sex-negative*) is expected to yield briefer reaction times, based on the assumption that performance is faster when the association between target and attribute is congruent with the participant's representational network, compared with when this association is incongruent.

The attribute categories for the success-failure ST-IAT were *sexual success* (represented by the Dutch words for capable, achievement, appreciation, and orgasm) and *sexual failure* (represented by the Dutch words for unable, fail, weak, and fall short). The selection of stimulus words was based on pilot testing using a freely accessible online survey ([www.thesistools.com](http://www.thesistools.com)). Fifty-five men completed the survey, with ages ranging from 19 to 75 years ( $M = 44.2$ ;  $SD = 14.4$  years). Participants were invited to select four words from two lists ( $N_{\text{success}} = 17$ ;  $N_{\text{failure}} = 21$ ) of preselected words that they thought best represented the categories of, respectively, sexual success and sexual failure. The four words that were chosen most frequently were selected to use in the success-failure ST-IAT. The labels of the attribute

categories were again continuously shown in the upper-left and -right corners of the screen. The liking and success-failure ST-IATs were presented in a fixed order, with the liking ST-IAT used as the first task.

#### Explicit associations with sexual stimuli.

*Explicit Evaluation Scale of Erotic Stimuli (EEES).* In addition to the automatic associations, two measures of explicit cognitive appraisals of erotic stimuli in terms of valence and sexual success-failure were created. For this purpose the erotic pictures that were used in each ST-IAT were presented on a computer screen. To obtain explicit valence ratings, participants evaluated the pictures used in the liking ST-IAT on a 5-point Likert scale ranging from *Very negative* to *Very positive*. To obtain explicit associations with success-failure, participants evaluated the pictures used in the success-failure ST-IAT on a visual analog scale (VAS) ranging from *Sexual failure* (0) to *Sexual success* (100). Per-participant mean rating scores across the four ST-IAT pictures were calculated that were termed EEES-L (liking), and EEES-SF (success-failure). Higher scores indicate that the erotic pictures were associated with positive liking and with sexual success.

#### Psychopathology.

*Hospital Anxiety and Depression Scale.* The HADS was used to screen for depression and anxiety symptoms (Kjaergaard, Arfwedson Wang, Waterloo, & Jorde, 2014). It is a 14-item self-report questionnaire, specifically used in hospital and outpatient clinic settings (Zigmond & Snaith, 1983). It is organized in two subscales for the domains of, respectively, anxiety and depression. High scores represent higher levels of anxiety and depression. The HADS has been found to possess satisfactory to high internal consistency in Dutch samples, with Cronbach's  $\alpha$  ranging from .71 to .90 (Spathoven et al., 1997). In the present study, the internal consistency was found to be satisfactory for the anxiety subscale (Cronbach's  $\alpha = .78$ ), almost satisfactory for the depression subscale (Cronbach's  $\alpha = .65$ ), and satisfactory for the total scale (Cronbach's  $\alpha = .83$ ).

**Table 2.** *Demographic, Medical, Sexual, and Psychological Functioning Characteristics of Participants (N = 70)*

	Total Sample (N = 70)		Nonsymptomatic Men (N = 26)		Men With Self-Reported Sexual Problems (N = 44)	
	M (SD)	N (%)	M (SD)	N (%)	M (SD)	N (%)
Demographics						
Age (18–78 yrs)	55.7 (14.9)		48.3 (12.7)		60.2 (14.4)	
Steady relationship (% yes)		70 (84)		23 (89)		36 (82)
Relationship duration (0.1–60.3 yrs)	27.6 (16.3)		20.4 (12.2)		32.1 (17.1)	
Education level						
Elementary–lower secondary		15 (21)		4 (15)		11 (25)
Higher secondary–professional		42 (60)		15 (58)		27 (61)
College–university		13 (19)		7 (27)		6 (14)
Clinical diagnosis <sup>a</sup>						
Erectile dysfunction		35 (50)		0 (0)		35 (80)
Orgasmic dysfunction		3 (4)		0 (0)		3 (7)
Lower urinary tract symptoms		25 (36)		4 (15)		21 (48)
Prostate disease		15 (21)		4 (15)		11 (25)
Hematuria		1 (1)		1 (4)		0 (0)
Kidney stones		5 (7)		3 (12)		2 (5)
Sterilization request		13 (19)		11 (42)		2 (5)
Scrotum/testes complaints		5 (7)		2 (8)		3 (7)
Phimosis		1 (1)		1 (4)		0 (0)
Penile deformity		1 (1)		1 (4)		0 (0)
Endocrine problem		1 (1)		0 (0)		1 (2)
Dermatological		1 (1)		1 (4)		0 (0)
Medication use						
No medication		28 (40)		17 (65)		11 (25)
Only pro-sexual medication		2 (3)		0 (0)		2 (5)
Pro-sexual and other medication		4 (6)		1 (4)		3 (7)
Pro-sexual, anti-sexual, and other medication		2 (3)		0 (0)		2 (5)
Only neutral medication		23 (33)		6 (23)		17 (39)
Only anti-sexual medication		4 (6)		1 (4)		3 (7)
Anti-sexual and other medication		7 (10)		1 (4)		6 (14)
Sexual functioning (IIEF)						
Erectile functioning (1–30)	14.7 (10.9)		25.0 (6.8)		8.6 (7.7)	
Orgasmic functioning (0–10)	5.8 (3.7)		8.7 (2.5)		4.1 (3.3)	
Sexual desire (2–10)	6.4 (2.1)		7.5 (1.4)		5.7 (2.1)	
Satisfaction with intercourse (0–15)	6.5 (5.2)		10.4 (4.4)		4.2 (4.3)	
Global sexual satisfaction (2–10)	6.2 (2.7)		8.2 (1.8)		5.0 (2.4)	
IIEF total score (5–75)	39.6 (22.0)		59.9 (14.1)		27.5 (16.1)	
Sexual distress (SDS)						
Total SDS score (0–48)	12.4 (11.0)		4.0 (5.4)		17.4 (10.4)	
Sexual health care history						
Professional help sought						20 (46)
Current professional help						21 (48)
Current desire for professional help						6 (14)
Psychological functioning (HADS)						
Anxiety (0–21)	3.9 (2.3)		3.8 (2.2)		4.0 (2.3)	
Depression (0–21)	2.6 (2.3)		2.5 (2.6)		2.7 (2.1)	

Note. High IIEF scores indicate high levels of sexual functioning; high SDS scores indicate high levels of sexual problem-related distress; high HADS scores indicate high levels of anxiety/depression.

<sup>a</sup>Multiple answers possible.

Participants with HADS total scores of 15 and higher were excluded.

## Procedure

Participants were recruited among patients visiting an outpatient urology clinic for clinical evaluation and treatment. Consecutive patients who met the inclusion and

exclusion criteria were invited for participation in the study by their practitioner. Interested patients received an information leaflet and an informed consent form. If they wished to participate, the patients received also a written summary of their current urological diagnosis and sexual functioning from the practitioner. Participants could schedule their participation either immediately or a later time. Upon the start of the test session, which took place in a



quiet space in the hospital, the test procedure was further explained by the researcher. After signing the informed consent form, participants handed over the doctor's summary to the researcher. First, the ST-IAT tasks were performed. Subsequently, participants completed the online questionnaires (demographic questions, information on sexual problems, sexual-problem-related distress, sexual health care history, explicit ratings of the ST-IAT erotic pictures [EEES], and three questionnaires [IIEF, SDS, and HADS]). Data collection took 26 weeks. Ethical approval was obtained from the hospital's ethical review board.<sup>2</sup>

**Statistical Analysis.** To index the automatic associations of erotic stimuli with liking and with success versus failure, the D600 algorithm of Greenwald, Nosek, and Banaji (2003) was employed. Only test trial data were used to calculate the D600 ST-IAT index. Reaction times (RTs) below 400 ms were discarded and those higher than 2,500 ms were replaced with 2,500 before calculation of the mean RTs. RTs from error trials were replaced with the mean RT of the participant's correct responses in the same block in which the error occurred plus a 600 ms penalty. The D600 index score was calculated as the difference score between the mean RTs to the sex-positive and sex-negative combination blocks (sex positive minus sex negative), divided by the standard deviation calculated across all blocks with the exception of the attribute practice block. For the sexual success-failure ST-IAT the same procedure was followed. Lower D600 index scores indicate that erotic stimuli are more strongly associated with positive (versus negative) valence and with success (versus failure).

Analyses were performed using SPSS, Version 22. Data were examined to check the assumptions for statistical analyses. The correlations between the variables used for hypotheses testing were inspected. To test hypothesis 1 and 2, hierarchical linear regression analyses were performed with age (first step), and implicit and explicit liking and success-failure indices (second step) as independent

variables and, respectively, sexual functioning (IIEF total score) and sexual distress (SDS total score) as dependent variables. Effect sizes were calculated (Steiger, 2004).

## Results

### Preliminary Analyses

Participants' sexual functioning scores and their scores indexing sexual-problem-related distress were found to show wide variation. The bivariate correlations between implicitly measured associations of erotic stimuli with liking and success-failure, the explicit ratings of erotic stimuli, the IIEF subscale and total scores, and the SDS scores are shown in Table 3. Whereas the automatic associations of erotic stimuli with liking and with success versus failure were not significantly correlated with each other or with the explicit associations, both explicit measures correlated significantly. Positive ratings of erotic stimuli in terms of liking came with higher explicit appraisal of erotic stimuli in terms of success. Sexual desire correlated positively with explicit ratings of erotic stimuli in terms of liking and of success versus failure. Satisfaction with sexual intercourse correlated positively with explicit success. Overall sexual satisfaction correlated positively with automatic liking of erotic stimuli. Finally, sexual distress correlated positively with both explicit ratings.

### Associations of Automatic and Explicit Associations With Sexual Functioning and Sexual Distress

Hierarchical linear regression analyses were performed with, respectively, level of sexual functioning (IIEF total score) and sexual distress (SDS score) as dependent variables, with standardized age as the predictor variable in the first step, and with ST-IAT liking and success-failure scores, EEES-L and EEES-SF sum scores, and the interaction terms of age with the automatic and explicit cognition variables as predictor variables in the second step. For each analysis the

**Table 3.** *Bivariate Correlations Between Automatic and Explicit Associations of Erotic Stimuli With Valence and Success versus Failure, Sexual Functioning Indexes, and Sexual Distress*

	D600 Liking	D600 Success-Failure	EEES-L	EEES-SF
D600 liking				
D600 success-failure	.16	—		
EEES-L	-.20	-.18	—	
EEES-SF	-.10	-.08	.53**	—
Age	.13	.13	-.07	-.10
IIEF total score	.17	-.15	.10	.21
SDS total score	-.15	.18	.32**	.25*

*Note.* EEES-L = Explicit Liking Associations With Sexual Stimuli; EEES-SF = Explicit Success-Failure Associations With Sexual Stimuli.  
 $p < .05$ ; \*\* $p < .01$  (two-tailed).

<sup>2</sup> METC Zuyderland-Zuyd, file 16-N-32, March 2, 2016.

**Table 4.** Hierarchical Linear Regressions of Automatic Liking, Automatic Sexual Success versus Sexual Failure Associations, and Explicit Ratings of Erotic Stimuli on Sexual Functioning Level<sup>a</sup>

Predictor Variables	<i>B</i>	<i>SE</i>	Beta	<i>t</i>	<i>p</i>	95% CI	
<i>Step 1: R<sup>2</sup> = .14, F (1, 75) = 11.93, p = .001 (IV = Age)</i>							
(Constant)	40.141	2.284		17.578	.000	35.592	44.691
Age	−8.079	2.339	−.370	−3.454	.001	−12.738	−3.419
<i>Step 2: R<sup>2</sup> change = .21, F (8, 67) = 2.73, p = .012 (IV = Automatic Associations and Explicit Ratings of Erotic Stimuli)</i>							
(Constant)	41.931	12.392		3.384	.001	17.197	66.666
Age	−31.966	11.981	−1.466	−2.668	.010	−55.880	−8.052
ST-IAT liking	77.437	27.899	1.454	2.776	.007	21.750	133.123
ST-IAT success-failure	−36.297	22.851	−.720	−1.588	.117	−81.908	9.313
EEES-L	−.198	.138	−.587	−1.436	.156	−.474	.077
EEES-SF	−.076	.111	−.321	−.686	.495	−.296	.145
Age × ST-IAT liking	−.969	.450	−1.127	−2.153	.035	−1.867	−.071
Age × ST-IAT success-failure	.476	.380	.559	1.253	.215	−.283	1.235
Age × EEES-L	.003	.002	.779	1.229	.223	−.002	.008
Age × EEES-SF	.002	.002	.635	1.068	.289	−.002	.006

Note. EEES-L = Explicit Liking Associations With Sexual Stimuli; EEES-SF = Explicit Success-Failure Associations With Sexual Stimuli.

<sup>a</sup>IIEF total score.

**Table 5.** Hierarchical Linear Regressions of Automatic Liking, Automatic Sexual Success versus Sexual Failure Associations, and Explicit Ratings of Erotic Stimuli on Sexual Distress Level<sup>a</sup>

Predictor Variables	<i>B</i>	SE	Beta	<i>t</i>	<i>p</i>	95% CI	
<i>Step 1: R<sup>2</sup> = .001, F (1, 75) = .088, p = .77 (IV = Age)</i>							
(Constant)	13.499	1.323		10.206	.000	10.865	16.134
Age	.403	1.355	.034	.297	.767	−2.296	3.101
<i>Step 2: R<sup>2</sup> change = .28, F (8, 67) = 3.26, p = .003 (IV = Automatic Associations and Explicit Ratings of Erotic Stimuli)</i>							
(Constant)	−7.907	7.011		−1.128	.263	−21.900	6.086
Age	9.626	6.778	.820	1.420	.160	−3.903	23.155
ST-IAT liking	−38.561	15.783	−1.345	−2.443	.017	−70.064	−7.057
ST-IAT success-failure	29.064	12.928	1.071	2.248	.028	3.261	54.868
EEES-L	.161	.078	.887	2.064	.043	.005	.317
EEES-SF	.009	.063	.068	.139	.890	−.116	.133
Age × ST-IAT liking	−.002	.001	−.816	−1.224	.225	−.004	.001
Age × ST-IAT success-failure	.000	.001	−.120	−.192	.848	−.002	.002
Age × EEES-L	.507	.255	1.095	1.990	.051	−.001	1.015
Age × EEES-SF	−.339	.215	−.740	−1.577	.120	−.768	.090

Note. EEES-L = Explicit Liking Associations With Sexual Stimuli; EEES-SF = Explicit Success-Failure Associations With Sexual Stimuli.

<sup>a</sup>SDS total score.

assumptions of normality, linearity, and collinearity, and the presence of outliers, were evaluated.

The first linear regression analysis was performed with level of sexual functioning as the dependent variable. The regression model with age as the predictor variable in the first step was significant when compared to a constant-only model,  $R^2 = .14$ ,  $F(1, 75) = 11.93$ ,  $p = .001$  (see Table 4). In the second step, the model explained additional variance,  $R^2$  change = .21,  $F(8, 67) = 2.73$ ,  $p = .012$ . In addition to age, automatic liking and the interaction of age and automatic liking were significant predictors of sexual functioning level (see Table 4 for statistical details). Separate analyses for relatively high and relatively low age subgroups indicated that only in the lower age group did the model reach significance ( $F(4, 23) = 4.83$ ,  $p = .006$ ). Higher level of sexual functioning was predicted by lower automatic

(Beta = .557,  $p = .003$ ) and lower explicit (Beta = -.616,  $p = .002$ ) liking of erotic stimuli. The automatic association of erotic stimuli with success versus failure showed no additional independent relationship with the level of sexual functioning.

The second linear regression analysis was performed with level of sexual distress as the dependent variable. The regression model with age in the first step was not found to be significantly different from a constant-only model,  $R^2 = .001$ ,  $F(1, 75) = 0.088$ ,  $p = .77$  (see Table 5). When the other predictor variables were entered in the second step, however, a significant increase of the proportion of explained variance was found,  $R^2$  change = .28,  $F(8, 67) = 3.26$ ,  $p = .003$ . Automatic liking, automatic success-failure associations, and explicit liking ratings all showed an independent relationship with sexual distress (see Table 5 for statistical details). Higher sexual distress was

associated with more positive automatic affective associations with erotic stimuli, by stronger automatic sex-failure associations, and by more positive explicit appraisals of erotic stimuli.

### Discussion

In this study, implicit measures of automatic associations and explicit measures of subjective associations with erotic stimuli were investigated in a sample comprising both men with and men without sexual problems. The major findings were as follows: (a) lower levels of sexual functioning came with stronger automatic sex-positive associations, most prominently in the younger age group; (b) in younger men, there was an additional independent negative relationship between explicit sex-liking associations and sexual functioning; and (c) the higher the level of sexual distress, the stronger the automatic and explicit sex-liking associations, and the stronger the automatic sex-failure associations.

The negative relationship between sexual functioning and automatic liking associations is consistent with previous findings showing that men with self-reported sexual dysfunction exhibited stronger automatic sex-liking associations than men without sexual dysfunction (van Lankveld et al., 2015). This link between stronger automatic liking of erotic stimuli and lower level of sexual functioning thus seems a robust phenomenon. A possible explanation of this initially counterintuitive finding might be that the strong positive affective associations in men with lower levels of sexual functioning reflect a strong positive appreciation of sexual stimuli that they, however, do not necessarily also experience with their own partner as a sexual stimulus. The erotic stimuli that were used in the implicit task depicted anonymous professional porn actors. The positive automatic association with these sexual stimuli in men with lower levels of sexual functioning might be the result of a learning process after repeated exposures to explicit pornographic images of sexual intercourse and coupling of these stimuli with the rewarding experience of experiencing orgasm through masturbation, as opposed to the negative emotional experiences with their partners. Perhaps different results would be found if pictures were used that displayed each participant's own partner. Support for this speculative explanation is provided by previous research in our lab, in which the presence of the participant's partner in the testing room was associated with a differential pattern of responses to erotic stimulation under conditions of self-focused versus non-self-focused attention, compared to testing without the partner's presence (van Lankveld et al., 2014). In addition, it could be that the relatively strong positive associations with sex in men with a low level of sexual functioning reflect a relatively strong desire for the sexual interactions displayed in the pictures that contrasts with their actual sexual interactions, and it might be this discrepancy that drives their sexual dysfunction. To test these tentative explanations, future studies need to be conducted comparing the links between level of sexual functioning and sexual distress, on the one hand, and general versus personal automatic sex-liking associations on the other hand.

For this purpose, implicit association tasks could be used that include, respectively, general/impersonal erotic stimuli versus more personalized erotic stimuli. In addition, level of experience with masturbation during pornography consumption should be controlled for.

The current findings further showed that low sexual functioning was not linked with relatively strong sex-failure associations. Interestingly, sexual distress did show a relationship with automatic sex-failure associations. This association is in line with the findings of Nobre and Pinto-Gouveia in their studies using the Sexual Modes Questionnaire (Nobre & Pinto-Gouveia, 2003) to compare men and women with and without sexual dysfunction (Nobre & Pinto-Gouveia, 2008). Feelings of sadness and disillusion were positively related in that study to negative automatic thoughts of erection concern in men and thoughts of failure and disengagement in women. Note, however, that these were cross-sectional data, and that participants were asked to what extent they recognized the presence of certain automatic thoughts during sexual interactions that were listed in the questionnaire, which does not necessarily coincide with implicit associations of which one is not aware. To further explain this apparent discrepancy, it may be useful to consider potential differences between sexual functioning and sexual distress. Although related, problems with sexual functioning and the distress associated with sexual problems may not spring from the same source. Likewise, sexual satisfaction and sexual distress may not be each other's opposite; indeed, they are increasingly considered to be relatively independent factors that should be investigated separately (Stephenson & Meston, 2010). Germane to this, previous research has shown that although increasing age comes with increasing impairments in male sexual functioning (Wagle et al., 2012), sexual distress does not necessarily increase at the same pace (Hendrickx, Gijss, & Enzlin, 2016). A similar divergence was also noted in women (Stephenson & Meston, 2010, 2012). The current findings not only corroborate the relevance of differentiating between low sexual functioning and sexual distress but also provide evidence to indicate that the automatic activation of failure associations within the context of sex might be especially relevant with regard to sexual distress but not so much with low sexual functioning per se (Hendrickx, Gijss, & Enzlin, 2016). Before arriving at more definitive conclusions in this respect, it would be important to test the robustness of the current finding that specifically sexual distress was linked to automatic sex-failure associations.

Consistent with previous research in the same population and using the same methodology (van Lankveld et al., 2015), overall there was no robust relationship between explicit sex-liking associations and sexual functioning, although there was evidence that, especially in the younger age group, sexual function was associated with stronger sex-positive associations. Again, the direction of this association seems counterintuitive but is consistent with the findings with regard to automatic associations. In addition, higher sexual distress was also associated with stronger sex-

positive associations. Together, this pattern of findings is in line with the testable explanation that perhaps for men with relatively high levels of distress or sexual problems there is a discrepancy between their (relatively positive) appreciation of sex in general and their actual (relatively negative) sex experience with their own sex partners.

The findings in this study may also contribute to existing theories of sexual dysfunction. The observed relationships between sexual functioning and sexual distress, on the one hand and both implicitly and explicitly measured sex-associations on the other, points to the relevance of including cognitions operating at various levels of awareness and self-control in the study of sexual functioning. The repeated finding of a significant link between automatic associations with sexual stimuli and level of sexual functioning supports the theorized claim that automatic cognitive processing may play a role in the regulation of sexual arousal (Janssen et al., 2000; van Lankveld et al., 2015). More definitive claims of the possible causal role in sexual functioning, however, must await confirmation from experimental investigation. We recommend to awaiting further experimental evidence to confirm the causal role of automatic cognitions in sexual dysfunctioning before suggesting additions to the existing therapeutic arsenal. The observed discrepancy in the present findings (automatic associations of sexual stimuli with liking are connected with sexual functioning, whereas automatic associations with success versus failure are connected with sexual distress) can be taken to support the notion that sexual functioning and sexual-problem-related distress have different sources and etiological pathways (Burri, Lachance, & Williams, 2014; Hendrickx et al., 2013; Hendrickx, Gijs, & Enzlin, 2016; Stephenson & Meston, 2010). Although distress can involve experiencing maladaptive negative emotions, it may also serve important adaptive purposes (Tooby & Cosmides, 2008)—among others, to alert, motivate, and prepare the individual to actively cope with distressing events (Dekker et al., 2017).

A limitation of the present study is self-selection bias, which is typical for sexuality research (Plaud, Gaither, Hegstad, Rowan, & Devitt, 1999) and may also have confounded the present data. It might have resulted in inclusion of higher numbers of men with sexual problems who harbor relatively positive automatic sex-liking associations. Another limitation is the relatively high age in our sample. This is due to the recruitment of participants in an outpatient urology clinic, which is predominantly visited by older age groups of men with urological complaints. In future studies, more representative samples should be investigated to examine if the present findings also hold true in younger men. Other potential, sample-related limitations pertain to relationship status and sexual activity. About 25% of the study participants were not living in a relationship, and an additional 15% reported not being sexually active. It is unknown how these sample characteristics may have influenced the present findings. Nevertheless, we think the

present findings should be considered with caution and wish to emphasize the need for replication studies.

To conclude, the present findings corroborate the relevance for both automatic and controlled appraisals in sex research. Most importantly, the study showed that men with lower levels of sexual functioning are characterized by relatively positive automatic associations with general/nonpersonalized sex stimuli, which may reflect a discrepancy between their strong desire for positive sexual experiences and their actual sexual experiences. In addition, the current findings are consistent with the view that automatic sex-failure associations may contribute to sexual distress. It may be relevant to test in future research whether modifying these dysfunctional automatic associations would have desirable therapeutic effects (see Clerkin & Teachman, 2011).

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